

Pediatric Dental Care: Prevention and Management Protocols Based on Caries Risk Assessment

FRANCISCO J. RAMOS-GOMEZ, DDS, MS, MPH; YASMI O. CRYSTAL, DMD;
MAN WAI NG, DDS, MPH; JAMES J. CRALL, DDS, SCD; AND JOHN D.B. FEATHERSTONE, PHD

ABSTRACT During pregnancy, numerous physiologic changes occur that allow the mother to accommodate the needs of the developing fetus. Oral health care professionals should be knowledgeable about these changes and the impact they have on the safe provision of prophylactic and therapeutic dental care to pregnant women. Herein, the authors describe maternal physiologic adaptations and discuss changes in drug processing and placental drug transfer in order to enhance the knowledge base of oral health care professionals.

AUTHORS

Francisco J. Ramos-Gomez, DDS, MS, MPH, is a professor at the University of California, Los Angeles, School of Dentistry, Section of Pediatrics, and a researcher for the University of California, San Francisco, Center to Address Disparities in Children's Oral Health — CANDO.

Yasmi O. Crystal, DMD, maintains a clinical practice, Comprehensive Pediatric Dentistry, in New Jersey.

Man Wai Ng, DDS, MPH, is dentist-in-chief and assistant professor, Oral and Developmental Biology at the Harvard School of Dental Medicine.

James J. Crall, DDS, SCD, is professor of pediatric dentistry at the University of California, Los Angeles, and project director for the American Academy of Pediatric Dentistry Head Start Dental Home Initiative.

John D. Featherstone, PhD, is dean and a professor at University of California, San Francisco, School of Dentistry.

ACKNOWLEDGMENTS

The authors wish to acknowledge NIDCR — R21DE018650-01 for providing support for research and the PRIME team and staff at the San Francisco Native American Health Center for development of the CAMBRA 0-5 instrument. They also thank Dr. Norman Tinanoff for contributing his support and knowledge to this project; CSPD and Dr. Paul Reggiardo for their invitation to contribute for this publication; Ms. Debra Tom for her editorial assistance; and in addition, to HRSA — Oral Health Disparities Collaborative

for implementation of the CAMBRA instrument and development of the self-management goal instrument through High Plains Health Center. The authors also wish to acknowledge the Western CAMBRA coalition and the American Academy of Pediatric Dentistry for its support and leadership on development of the caries risk assessment tool, and the committee and staff of the American Academy of Pediatrics and their project, "Brightening Oral Health: Implementing Oral Health Risk Assessments in Pediatric Care."

A 2007 publication by the Centers for Disease Control and Prevention reported that although dental caries prevalence had declined significantly among school-aged children since the early 1970s, caries rates in children aged 2-5 years had increased.² This confirmed early childhood caries (ECC) as the most prevalent chronic childhood disease in the United States; five times more common than asthma and seven times more common than hayfever.³⁻⁵ ECC is more prevalent among young children in low socioeconomic populations and among racial/ethnic minorities who are also more likely to face barriers in accessing care.⁶ Caries is a preventable infectious disease and it is well-documented that one of the

best predictors for future tooth decay is the presence of current caries or evidence of prior caries experience.^{7,8}

Despite awareness of an increase in ECC prevalence, infant oral health care, as well as the establishment of a dental home by age 1, or when the first tooth erupts, has not yet become the standard of care in clinical practice. The Dental Health Foundation's report, *Mommy It Hurts to Chew* indicated that 28 percent of California third-graders had untreated tooth decay.^{6,9} It also showed that only 35 percent of reporting families had private dental insurance, 42 percent had some type of government-funded coverage, and nearly a quarter (23 percent) had no dental coverage at all.⁶

In 2007, a half-million school-aged children missed at least one day of school in California due to dental problems.¹⁰ This resulted in \$29.7 million of lost revenue to school districts.¹⁰ In the National Survey of Children's Health, California ranked near the bottom in children's oral health (only Arizona and Texas ranked lower).¹¹

Several reports have shown that preventing the onset of ECC is more cost effective compared to treating advanced caries. Typical costs of comprehensive oral care visits for preschoolers are considerably less than the cost of emergency room treatment or extensive restorations requiring sedation or treatment under general anesthesia.^{12,13} Early identification of risk indicators and implementation of oral health preventive practices at a young age can reduce or avoid caries progression.¹⁴ The American Dental Association, the American Academy of Pediatric Dentistry (AAPD), the American Academy of Pediatrics (AAP), the American Association of Public Health Dentistry (AAPHD), and the Academy of General Dentistry (AGD),

all recommend that a child see a dentist to establish a dental home by age 1 or within six months from eruption of the first primary tooth.¹⁵⁻¹⁹ A dental home is defined as the ongoing relationship between the dentist and the patient, inclusive of all aspects of oral health care delivered in a comprehensive, continuously accessible, coordinated, and family centered way.²⁰ Establishment of a dental home should include referrals to dental specialists when appropriate.²¹

Despite widespread support for estab-

**IN 2007,
a half-million school-aged
children missed at least
one day of school in
California due to
dental problems.**

lishing a dental home by age 1, infant oral health visits have not yet been embraced universally by practicing clinicians. This situation persists even as dental and other health professionals recognize the growing prevalence of early childhood caries.

This article presents an updated pediatric dental caries management by risk assessment (CAMBRA) approach, along with practical tools to use in caring for young children, to stimulate greater adoption of infant oral health care programs by clinicians.¹⁴ Age- and risk-specific "care paths" are included as a part of a "disease-prevention management model."

Perinatal Oral Health

Caries is a transmissible, infectious disease. When the disease is allowed to progress, surface cavitation and destruc-

tion of dental tissue occur over time. Due to their ability to stick to smooth tooth surfaces and produce copious amounts of acid, the mutans streptococci (MS) group of bacteria is considered one of the most important groups of pathogens in the cariogenic process.²⁰

Primary caregivers can transmit these organisms to their children, which results in MS colonization of the child's oral cavity.²¹ There is a direct relationship between adult caregiver MS levels and MS levels and dental caries prevalence in their children.²¹ Factors influencing colonization include frequent sugar exposure in infants and habits that allow salivary transfer from mothers to infants. Maternal factors, such as high levels of MS, poor oral hygiene, low socioeconomic status, and frequent snacking increase the risk of bacterial transmission to their infants.²² Infants have tested with high levels of MS even before the eruption of their first tooth.²²

Therefore, it is critical to consider an infant oral care program in the context of a mother-child pair or dyad, which includes comprehensive maternal perinatal oral health care and treatment.

Dental professionals have begun to recognize the critical role a mother plays in ensuring her child's oral health. Improving expectant mothers' oral health by reducing pathogenic bacteria levels in their own mouths can delay the acquisition of oral bacteria in their children and may delay the development of early childhood caries.²³ Restoring carious lesions, by itself, is insufficient to reduce a mother's risk of transmitting cariogenic bacteria to her offspring. An effective perinatal program should institute a long-range, pre- and postpartum maternal strategy to reduce maternal MS and lactobacilli levels through therapeutic interventions and counseling on lifestyle modifications.²³

Unfortunately, pregnant women often do not receive oral health care and education in a timely manner. Many women do not know they should seek dental care during their pregnancy and for the many others who do, they often encounter dentists unwilling to provide dental care during pregnancy. New mothers are more likely to be receptive to ideas that would improve their offspring's oral health and both dental and obstetric providers have a prime opportunity to educate mothers on changes that could improve their children's oral health.²⁴ In 2010, the CDA Foundation published evidence-based guidelines for health profession on oral health for pregnant women and infants, which indicate that perinatal oral health care is not only safe but necessary to the oral and overall health of the pregnant mother but also that of her infant.²³

In light of the importance of perinatal oral health in preventing early childhood caries, and the need to intervene early for mother and child in a "dual parallel track" of treatment and disease prevention management, collaborations and partnerships among all health professionals are encouraged to foster early and timely oral health care and referrals for expectant mothers.

The American Academy of Pediatrics has focused in improving children's oral health through its Oral Health Initiative and Section on Pediatric Dentistry and Oral Health (aap.org/oralhealth). Through these efforts, pediatricians are becoming more educated on oral health and their role in preventing disease and referring to a dental home. However, many continue to be unaware of the AAP's current oral health recommendations and more work needs to be done to disseminate this policy and raise awareness. Efforts to increase awareness of

incorporating oral health evaluations into well-child visits are crucial since pediatricians often see children on an average of up to six times before age 2.

In addition to pediatricians, family practitioners, and other medical providers who see children frequently during infancy and early childhood are also ideally suited to assess young children for caries risk assessment and refer for dental care.²⁵ A partnership between medical and dental professionals is important to increase patient aware-

**PARTNERSHIPS AMONG
all health professionals
are encouraged to
foster early and timely
oral health care and
referrals for
expectant mothers.**

ness of the importance of establishing a dental home by the child's first birthday, assessing caries risk, and coordinating care. As an important step in that direction, the AAP's "Bright Futures Guidelines for Health Supervision of Infants, Children, and Adolescents," which focuses on health promotion and prevention for children and their families, not only advocates for a dental home but also provides extensive information, education and training opportunities, and materials on pediatric oral health for a broad range of practitioners. The AAP is currently conducting a Bright Futures Implementation Project, Brightening Oral Health, to pilot test an oral health risk assessment tool for the primary care practitioner. See **TABLE 1**.²⁵

Initial Infant Oral Care Visit

Infants and parents can benefit from early infant oral health visits and early establishment of a dental home. Infant oral health visits should include caries risk assessment, individualized preventive strategies and anticipatory guidance.²⁷ Periodic supervision of care intervals (periodicity) should be determined based on each patient's risk of disease and include age-and risk-appropriate "care paths" for management of the disease process.¹⁴

Infants and toddlers should not be expected to be cooperative during an oral examination. Crying and movement are developmentally age-appropriate behaviors for young children. Explaining expected behaviors to parents prior to, during and after infant care visits can help allay any fears and concerns they may have.

There is a simple six-step protocol for an infant oral care visit:

1. Caries risk assessment;
2. Proper positioning of the child (knee-to-knee exam);
3. Age-appropriate toothbrushing prophylaxis;
4. Clinical examination of the child's oral cavity and dentition;
5. Fluoride varnish treatment; and,
6. Assignment of risk, anticipatory guidance, self-management goals and counseling.

1. Caries Risk Assessment

An individualized risk assessment of an infant or toddler for developing caries serves as the foundation for health care providers and parents/caregivers to identify and understand the child's ECC risk factors. The specific information gained from a systematic assessment of caries risk guides the dentist in the decision-making process for treatment and preventive protocols for children already with disease and those deemed

TABLE 1

AAP-Recommended Sticker Version of Caries Risk Assessment Tools

Brightening Oral Health Project

Oral Health Risk Assessment Tool

This is a: 9-month visit ☐12-month visit ☐

Risk Factors	Protective Factors	Disease Indicators (clinical examination)
Has mother or primary caregiver had active decay in the past 12 months? Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes No <input type="checkbox"/> <input type="checkbox"/> Existing dental home	<input type="checkbox"/> White spots or visible decalcifications
Does mother have a dentist? Yes <input type="checkbox"/> No <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> Drinks fluoridated water or takes F supplements	<input type="checkbox"/> Obvious decay
Other risk factors: Yes No	<input type="checkbox"/> <input type="checkbox"/> F varnish in the last 6 months	<input type="checkbox"/> Restorations present
<input type="checkbox"/> <input type="checkbox"/> Continual bottle/sippy cup use with fluid other than water	<input type="checkbox"/> <input type="checkbox"/> Child has teeth brushed daily with fluoridated toothpaste*	<input type="checkbox"/> Visible plaque accumulation
<input type="checkbox"/> <input type="checkbox"/> Frequent snacking		<input type="checkbox"/> Gingivitis (swollen/bleeding gums)
<input type="checkbox"/> <input type="checkbox"/> Special health care needs		<input type="checkbox"/> None
<input type="checkbox"/> <input type="checkbox"/> Low SES/health literacy/Medicaid eligible		<input type="checkbox"/> No Teeth Present

Caries Risk: ☐ Low ☐ High

Completed: ☐ Anticipatory guidance ☐ Fluoride varnish Referral to: _____

Goals: _____

*Current AAPD recommendation, not currently the recommendation of Bright Futures or the CDC.

Adapted from: Preventive Oral health Intervention for Pediatricians (2008), Oral Health Risk Assessment, Timing and Establishment of the Dental Home (2003), and Ramos-Gomez, FJ, Crall, et al, Featherstone J, Caries risk assessment appropriate for the age 1 visit (infants and toddlers). *J Calif Dent Assoc* 35(10) 697-702, October 2007. Distributed with funding from Crest and Oral-B Health Smiles, P&G Live, Learn and Thrive Initiative.

at risk. For optimal outcomes, caries risk assessment should be done as early as possible, and preferably, prior to the onset of the disease process. Since caries in the primary dentition is a strong predictor of caries in the permanent dentition, caries risk assessment and therapeutic management of the disease is crucial, as is the subsequent follow-up.^{28,29}

Risk factors are determined from an interview with the parent and from a clinical assessment of the child. Further details, where evidence-based disease indicators, biological risk factors and pre-

ventive factors are described, have been previously published by Ramos-Gomez et al. and are accessible via the web at cdafoundation.org/journal.¹⁴ The example provided in **TABLE 2** is a one-page, practical form for use in the dental office and has been modified from the original form published by Ramos-Gomez et al. based on the collective experience of pediatric dentists using the form and recommendations developed by the NIDCR-PRIME research at the SF NAHC and the CAMBRA coalition committee of West Coast Dental Schools. **TABLE 3** in the present

article offers further modifications of the original published form that is an alternative currently suggested by the AAPD.

In practice, the caries risk assessment would begin in the dental office with an initial interview with the parent or caregiver. The assessment interview should explore biological or lifestyle predisposing risk factors that contribute to the development or progression of caries. Examples of these risk factors include recently placed dental restorations or active caries in the mother, low health literacy of caregiver, frequent intake of fermentable carbohy-

TABLE 2

CAMBRA — Caries Risk Assessment Form for Age 0 to 5 Years

Patient Name: _____ ID# _____ Age: _____ Date: _____

Assessment Date: _____ Please circle: BASELINE, three-month follow-up or six-month follow-up

	1	2	3	
NOTE: Any one Yes in Column 1 signifies likely "High Risk" and an indication for bacteria tests	Yes =CIRCLE	Yes =CIRCLE	Yes =CIRCLE	Comments:
1. Risk Factors (Biological Predisposing Factors)				
(a) Mother or primary caregiver has had active dental decay in the past 12 months*	Yes			
(b) Bottle with fluid <u>other</u> than water, plain milk and/or plain formula		Yes		Type of fluid:
(c) Continual bottle use		Yes		
(d) Child sleeps with a bottle, or nurses on demand		Yes		
(e) Frequent (>3 times/day) between-meal snacks of sugars/cooked starch/sugared beverages		Yes		#times/day:
(F) Saliva-reducing factors are present, including: 1. medications (e.g., some for asthma [albuterol] or hyperactivity) 2. medical (cancer treatment) or genetic factors		Yes		
(g) Child has developmental problems/CSHCN (child with special health care needs)		Yes		
(h) Caregiver has low health literacy, is a WIC participant and/or child participates in Free Lunch Program and/or Early HeadStart		Yes		
2. Protective Factors				
(a) Child lives in a fluoridated community or takes fluoride supplements by slowly dissolving or as chewable tablets (note resident ZIP code)			Yes	
(b) Child drinks fluoridated water (e.g., use of tap water)			Yes	
(c) Teeth brushed with fluoridated toothpaste (pea size) at least once daily			Yes	
(d) Teeth brushed with fluoride toothpaste (pea size) at least 2x daily			Yes	
(e) Fluoride varnish in last six months			Yes	
(f) Mother/caregiver chews/dissolves xylitol chewing gum/lozenges 2-4x daily			Yes	
3. Disease Indicators/Risk Factors – Clinical Examination of Child				
(a) Obvious white spots, decalcifications enamel defects or obvious decay present on the child's teeth*	Yes			
(b) Restorations present (past caries experience for the child)*	Yes			
(c) Plaque is obvious on the teeth and/or gums bleed easily		Yes		
(d) Visually inadequate saliva flow		Yes		

Child's Overall Caries Risk* (circle):

High

Moderate

Low

Child: Bacteria/Saliva Test Results:

MS:

LB:

Flow Rate:

MI/min:

Date:

Caregiver: Bacteria/Saliva Test Results:

MS:

LB:

Flow Rate:

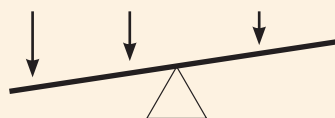
ml/min:

Date:

Self-management goals:

1) _____

2) _____



**VISUALIZE
CARIES BALANCE**

*Assessment based on provider's judgment of balance between risk factors/disease indicators and protective factors.

TABLE 3

Example of a Caries Risk Assessment Form for 0–5 Year Olds** as adopted in 2010 by the American Academy of Pediatric Dentistry (AAPD)

Biological Factors	High-Risk Factors	Moderate-Risk Factors	Protective Factors
Mother/primary caregiver has active caries	Yes		
Parent/caregiver has low socioeconomic status	Yes		
Child has >3 between-meal sugar containing snacks or beverages per day	Yes		
Child is put to bed with a bottle containing natural or added sugar	Yes		
Child has special health care needs		Yes	
Child is a recent immigrant		Yes	
Protective Factors			
Child receives optimally fluoridated drinking water or fluoride supplements			Yes
Child has teeth brushed daily with fluoridated toothpaste			Yes
Child receives topical fluoride from health professional			Yes
Child has dental home/regular dental care			Yes
Clinical findings			
Child has more than one dmfs	Yes		
Child has active white spot lesions or enamel defects	Yes		
Child has elevated mutans streptococci	Yes		
Child has plaque on teeth		Yes	

** Modified from Ramos-Gomez et al, *J Calif Dent Assoc* 35(10):687-702, October 2007, and ADA Caries Risk Assessment forms.

Instructions:

1. Circle the "Yes" wherever there is a yes answer to the question or observation for the patient or caregiver.
2. Use the "Yes" answers in the risk factor columns (red and yellow) versus the "Yes" answers in the protective factor column (green) to caries risk level of low, moderate, or high. If there are clinical observations that indicate current and ongoing disease (frank cavities) then these will outweigh the protective factors. When the restorative work is done and preventive (protective) measures are in place, the green "yes" answers can outweigh the risk factors.

Overall assessment of the child's dental caries risk **High** **Moderate** **Low**

Copyright © 2010–2011 by the American Academy of Pediatric Dentistry and reproduced with their permission.

drates by the infant, sleeping with a bottle that contains liquids other than water, prolonged use of a sippy cup containing milk, juice, or a sweetened beverage. The practitioner can simply circle "Yes" beside the risk or protective factors that apply in order to make a judgment as to whether the risk factors outweigh the protective factors or vice versa, thereby determining a risk status of low, moderate, or high. The risk level will then dictate which care path to be used, as described below.

Protective factors are indicators of preventive activities that may reduce a

child's risk for the onset extension of ECC and should be assessed during the parental interview. These factors include optimal exposure to fluoride, access to regular dental care (e.g., the presence of a dental home), and consistent daily brushing with fluoride toothpaste.

Disease indicators are indications of current and active caries and are obtained from the clinical examination of the child and include cavitated carious lesions, white spot lesions/decalcifications, and recent restorations. Biological risk factors are also

observed at the clinical examination and include the presence of plaque, gingival bleeding (an indicator of inadequate oral hygiene), and dry mouth. In older children, the presence of dental or orthodontic appliances increases plaque retention and the risk for caries.

The caries balance concept (**FIGURE 1**) states that the progression or reversal of dental caries is determined by the balance between pathological factors and caries protective factors.^{30–33} A risk assessment categorization of low, moderate, or high is based on a preponderance of

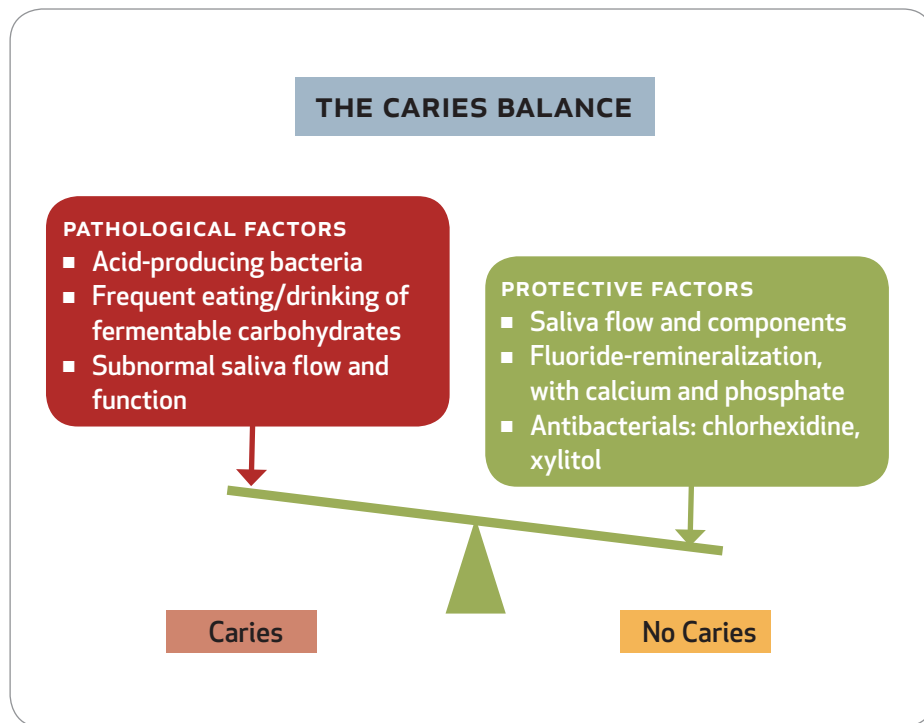


FIGURE 1. Caries balance.

the factors circled as “Yes” on the caries risk assessment form. When risk factors outweigh the protective factors, it indicates an increased likelihood for the development of caries, which would place the child in a high-risk category. When protective factors prevail and risk factors are controlled, the child can be considered low risk. The clinician’s experience, expertise, and personal historical experience with his patient and the child’s caregivers, is of vital importance in determining a child’s risk, which serves as the basis for an individualized treatment plan for each infant/caregiver. These specific patient conditions and risks will help the practitioner and the parents understand the factors that contribute to or protect the patient from caries.

2. Proper Positioning

Proper positioning of the child is critical to conducting an effective and efficient clinical exam in a young child. In general, the knee-to-knee position should be used with children ages 6 months to 3 years, or up to

age 5 with children who have special health care needs. Children older than 3 may be able to sit forward on their caregiver’s lap or sit alone in a chair. Examiners and caregivers need to work together to transition the child smoothly from the interview to the exam. The clinician should explain what will happen (“Tell-Show-Do”) prior to starting and anticipate that young children may cry since crying is developmentally appropriate for children at this age. If the child can perceive a friendly and comfortable interaction between the clinician and caretaker, a positive tone is frequently set for the visit. Knee-to-knee positioning allows the child to see the parent throughout the exam. It also allows the caregiver to observe clinical findings and hygiene demonstrations directly, while gently helping to stabilize the child safely for the clinical examination.

3. Toothbrush Prophylaxis

A toothbrush prophylaxis is efficient in removing plaque in most young children. It is also nonthreatening to young children and serves to demonstrate the







FIGURE 2. Knee-to-knee positioning.

proper technique of brushing to the caregiver. The examiner retracts the child’s lips and cheeks and demonstrates brushing along the gingival margins (FIGURE 2). The spongy handle of an age-appropriate toothbrush can be used to prop open the child’s mouth. The handle of a second toothbrush can be used as a mouth prop. During this “Tell-Show-Do” encounter, the caregiver should be encouraged to brush their child’s teeth at least twice a day, especially before bedtime. The use of fluoride toothpaste should be emphasized since fluoride has been shown to be effective both systemically and topically to prevent caries. Parents and caregivers should be instructed to use a “pea-sized” amount of fluoride toothpaste for children age 2-6 and a “smear” for children under age 2.³⁴ (FIGURE 3) Children should be taught to spit out excess toothpaste during and after brushing.

4. Clinical Examination

Clinical examination can be accomplished while counting the child’s teeth aloud, using the toothbrush handle as a mouth prop, if necessary. Many providers make a game of this task, singing songs, engaging the child’s attention, and, if all else fails, distracting the child with a brightly colored toothbrush or toy. Praise the child at each step for their cooperation and good behavior. While counting the teeth, the examiner also inspects the soft tissues, hard tissues, and occlusion, if the child is able to cooperate. Data from the clinical exam results should be combined with data from the caregiver interview to determine the child’s overall caries risk, establish an oral diagnosis, and formu-

Topical Fluoride Recommendations for High-Risk Children Under Age 6

Decision Support Matrix			
Population-based Risk Factors <ul style="list-style-type: none"> ■ Low-income children (e.g., enrolled in Head Start, WIC, free/reduced lunch program Medicaid or SCHIP eligible, or other programs serving low-income children) ■ Children with special health care needs 			
Fluoride Modality	Age	Children Under 2 Years	Children 2-6 Years
			
	Toothpaste	<ul style="list-style-type: none"> ■ Encourage parents and caregivers to take an active role in brushing their children's teeth once the first tooth erupts ■ Educate parents and caregivers on proper fluoride toothpaste use ■ Brush children's teeth with fluoride toothpaste twice daily ■ Use a smear of fluoride toothpaste  <p>Smear amount</p> <ul style="list-style-type: none"> ■ Do not rinse after brushing 	<ul style="list-style-type: none"> ■ Encourage parents and caregivers to take an active role in brushing their children's teeth ■ Educate parents and caregivers on proper fluoride toothpaste use ■ Brush children's teeth with fluoride toothpaste, or assist children with toothbrushing, twice a day ■ Use no more than a pea-sized amount of fluoride toothpaste  <p>Pea-sized amount</p> <ul style="list-style-type: none"> ■ Children should spit out extra toothpaste ■ Do not rinse after brushing
	Varnish	■ Apply every 3-6 months	■ Apply every 3-6 months
	Mouthrinses, gel, or foam	■ Not recommended	■ Not recommended

Decision Support Matrix developed by MCHB Expert Panel on Topical Fluoride, October 2007.

FIGURE 3. Topical fluoride recommendations for high-risk children younger than age 6.

The science of caries prevention continues to evolve. This table is an illustration on how to develop care paths for a practice's patients. There are many alternative approaches to the prevention and treatment of dental caries, with more emerging continuously. Care paths should remain dynamic and change over time as the effectiveness of new as well as current protocols is validated by scientific evidence.

TABLE 4

Example of a Caries Management Protocol for 0–2 Year Olds

Risk Category Ages 0 to 2	Diagnostic			Fluoride
	Periodic Oral Exams	Radiographs*	Saliva Test	
Low	Annual	Posterior bitewings at 12-24 month intervals if proximal surfaces cannot be examined visually or with a probe	Optional baseline	In office: No Home: Brush 2x day w/ smear of F toothpaste
Moderate	Every 6 months	Posterior bitewings at 6-12 month intervals if proximal surfaces cannot be examined visually or with a probe	Recommended	In office: F Varnish initial visit & recalls Home: Brush 2x day w/smear of F toothpaste Caregiver: OTC sodium fluoride treatment rinses
Moderate; Noncompliant	Every 3-6 months	Posterior bitewings at 6-12 month intervals if proximal surfaces cannot be examined visually or with a probe	Required	In office: F varnish initial visit & recalls Home: Brush 2x day w/smear of F toothpaste combined w/smear of 900 ppm calcium-phosphate paste, leave on at bedtime Caregiver: OTC sodium fluoride treatment rinses
High	Every 3 months	Anterior (#2 occlusal film) and posterior bitewings at 6-12 month intervals if proximal surfaces cannot be examined visually or with a probe	Required	In office: F varnish initial visit & recalls Home: Brush 2x day w/smear of F toothpaste combined w/smear of 900 ppm calcium-phosphate paste, leave on at bedtime Caregiver: OTC sodium fluoride treatment rinses
High; Noncompliant	Every 1-3 months	Anterior (#2 occlusal film) and posterior bitewings at 6-12 month intervals if proximal surfaces cannot be examined visually or with a probe	Required	In office: F varnish initial visit & recalls Home: Brush 2x day w/smear of F toothpaste combined w/smear of 900 ppm calcium-phosphate paste, leave on at bedtime Caregiver: OTC sodium fluoride treatment rinses
Extreme	Every 1-3 months	Anterior (#2 occlusal film) and posterior bitewings at 6-12 month intervals if proximal surfaces cannot be examined visually or with a probe	Required	In office: F varnish initial visit & recalls Home: Brush 2x day w/smear of F toothpaste combined w/smear of 900 ppm calcium-phosphate paste, leave on at bedtime Caregiver: OTC sodium fluoride treatment rinses

*American Dental Association Council on Scientific Affairs. The use of dental radiographs: update and recommendations. *J Am Dent Assoc* 137:1304-12, 2006.

**American Academy of Pediatric Dentistry. Guideline on pediatric restorative dentistry. *Pediatr Dent* 30(suppl):163-9, 2008.

Preventive Intervention						Restoration**
Xylitol Products	Sealants	Antibacterials	Anticipatory Guidance/ Counseling	Self-Management Goals	White Spot / Precavitated Lesions	Existing Lesions
Not Required	No	No	Yes	No	n/a	n/a
Child: Xylitol wipes Caregiver: 2 sticks of gum or 2 mints 4x day	Fluoride-releasing sealants recommended on deep pits and fissures	No	Yes	No	Treat w/ fluoride products as indicated to promote remineralization	n/a
Child: Xylitol wipes Caregiver: 2 sticks of gum or 2 mints 4x day	Fluoride-releasing sealants recommended on deep pits and fissures	Recommend for caregiver	Yes	Yes	Treat w/ fluoride products as indicated to promote remineralization	n/a
Child: Xylitol wipes Caregiver: 2 sticks of gum or 2 mints 4x day	Fluoride-releasing sealants recommended on deep pits and fissures	Recommend for caregiver	Yes	Yes	Treat w/ fluoride products as indicated to promote remineralization	ITR (interim therapeutic restorations) or conventional restorative treatment as patient cooperation and family circumstances allow
Child: Xylitol wipes Caregiver: 2 sticks of gum or 2 mints 4x day	Fluoride-releasing sealants recommended on deep pits and fissures	Recommend for caregiver	Yes	Yes	Treat w/ fluoride products as indicated to promote remineralization	ITR or conventional restorative treatment as patient cooperation and family circumstances allow
Child: Xylitol wipes Caregiver: 2 sticks of gum or 2 mints 4x day	Fluoride-releasing sealants recommended on deep pits and fissures	Recommend for caregiver	Yes	Yes	Treat w/ fluoride products as indicated to promote remineralization	ITR or conventional restorative treatment as patient cooperation and family circumstances allow

The science of caries prevention continues to evolve. This table is an illustration on how to develop care paths for a practice's patients. There are many alternative approaches to the prevention and treatment of dental caries, with more emerging continuously. Care paths should remain dynamic and change over time as the effectiveness of new as well as current protocols is validated by scientific evidence.

TABLE 5

Example of a Caries Management Protocol for 3–6-Year-Olds

Risk Category —Ages 3 to 6	Diagnostic			Fluoride
	Periodic Oral Exams	Radiographs*	Saliva Test	
Low	Annual	Posterior bitewings at 12-24 month intervals if proximal surfaces cannot be examined visually or with a probe	Optional baseline	In office: No Home: Brush 2x day w/ pea-size of F toothpaste
Moderate	Every 6 months	Posterior bitewings at 6-12 month intervals if proximal surfaces cannot be examined visually or with a probe	Recommended	In office: F Varnish initial visit & recalls Home: Brush 2x day w/ pea-size of F toothpaste Caregiver: OTC sodium fluoride treatment rinses
Moderate; Noncompliant	Every 3-6 months	Posterior bitewings at 6-12 month intervals if proximal surfaces cannot be examined visually or with a probe	Required	In office: F varnish initial visit & recalls Home: Brush 2x day w/ pea-size of F toothpaste combined w/ pea-size of 900 ppm calcium-phosphate paste, leave on at bedtime Caregiver: OTC sodium fluoride treatment rinses
High	Every 3 months	Anterior (#2 occlusal film) and posterior bitewings at 6-12 month intervals if proximal surfaces cannot be examined visually or with a probe	Required	In office: F varnish initial visit & recalls Home: Brush 2x day w/ pea-size of F toothpaste combined w/ pea-size of 900 ppm calcium-phosphate paste, leave on at bedtime Caregiver: OTC sodium fluoride treatment rinses
High; Noncompliant	Every 1-3 months	Anterior (#2 occlusal film) and posterior bitewings at 6-12 month intervals if proximal surfaces cannot be examined visually or with a probe	Required	In office: F varnish initial visit & recalls Home: Brush 2x day w/ pea-size of F toothpaste combined w/ pea-size of 900 ppm calcium-phosphate paste, leave on at bedtime Caregiver: OTC sodium fluoride treatment rinses
Extreme	Every 1-3 months	Anterior (#2 occlusal film) and posterior bitewings at 6-12 month intervals if proximal surfaces cannot be examined visually or with a probe	Required	In office: F varnish initial visit & recalls Home: Brush 2x day w/ pea-size of F toothpaste combined w/ pea-size of 900 ppm calcium-phosphate paste, leave on at bedtime Caregiver: OTC sodium fluoride treatment rinses

*American Dental Association Council on Scientific Affairs. The use of dental radiographs: update and recommendations. *J Am Dent Assoc* 137:1304-12, 2006.

**American Academy of Pediatric Dentistry. Guideline on pediatric restorative dentistry. *Pediatr Dent* 30(suppl):163-9, 2008.

Preventive Intervention						Restoration**
Xylitol Products	Sealants	Antibacterials	Anticipatory Guidance/ Counseling	Self-Management Goals	White Spot / Precavitated Lesions	Existing Lesions
Not Required	No	No	Yes	No	n/a	n/a
Child: Xylitol wipes/products to substitute for sweet treats or when unable to brush. Caregiver: 2 sticks of gum or 2 mints 4x day	Fluoride-releasing sealants recommended on deep pits and fissures	No	Yes	No	Treat w/fluoride products as indicated to promote remineralization	n/a
Child: Xylitol wipes/products to substitute for sweet treats or when unable to brush. Caregiver: 2 sticks of gum or 2 mints 4x day	Fluoride-releasing sealants recommended on deep pits and fissures	Recommend for caregiver	Yes	Yes	Treat w/fluoride products as indicated to promote remineralization	n/a
Child: Xylitol wipes/products to substitute for sweet treats or when unable to brush. Caregiver: 2 sticks of gum or 2 mints 4x day	Fluoride-releasing sealants recommended on deep pits and fissures	Recommend for caregiver	Yes	Yes	Treat w/fluoride products as indicated to promote remineralization	ITR (interim therapeutic restorations) or conventional restorative treatment as patient cooperation and family circumstances allow
Child: Xylitol wipes/products to substitute for sweet treats or when unable to brush. Caregiver: 2 sticks of gum or 2 mints 4x day	Fluoride-releasing sealants recommended on deep pits and fissures	Recommend for caregiver	Yes	Yes	Treat w/fluoride products as indicated to promote remineralization	ITR or conventional restorative treatment as patient cooperation and family circumstances allow
Child: Xylitol wipes/products to substitute for sweet treats or when unable to brush. Caregiver: 2 sticks of gum or 2 mints 4x day	Fluoride-releasing sealants recommended on deep pits and fissures	Recommend for caregiver	Yes	Yes	Treat w/fluoride products as indicated to promote remineralization	ITR or conventional restorative treatment as patient cooperation and family circumstances allow

late an individualized treatment plan.

The following information should be documented:

- Visible plaque and location;
- White spot lesions;
- Demineralized or remineralized enamel;
- Brown spots on the occlusal surfaces that may indicate caries;
- Tooth defects, deep pits/fissures, tooth anomalies;
- Missing and decayed teeth;
- Existing restorations;
- Defective restorations;
- Gingivitis or other soft tissue abnormalities;
- Occlusion; and
- Indications of trauma.

5. Fluoride Treatment

Fluoride is an important and cost-effective prevention method to strengthen tooth enamel and prevent decay. The ADA recommends that high caries risk children receive a full-mouth topical fluoride varnish application with reapplication consistently at three months intervals.³⁵ A minimum of every six months is recommended for children at moderate caries risk, even if the child lives in a community that already receives the benefits of water fluoridation³⁴ (FIGURE 3). Practitioners should also be aware that fluoridation of public water supplies can vary greatly by community and by the water source. Only 27.1 percent of Californians have access to optimally fluoridated community (tap) water.⁹ Providers should reiterate the cumulative benefit of the fluoride varnish, even if it has been mentioned earlier in the visit.⁴⁰ Following the fluoride application, the caregiver should be reminded not to allow brushing of the child's teeth or eating crunchy/sticky foods for the rest of the day to maximize the effect of the fluoride varnish.

6. Risk-Classification, Anticipatory Guidance, Self-Management Goals and Counseling

An individualized treatment plan (TABLES 4 AND 5) for each infant/caregiver is determined by the risk determined from the parent interview and the clinical examination of the child. A dual treatment plan approach is essential for moderate and high caries risk children and their parent/caregivers. Strategies need to be employed to modify the maternal transmission of cariogenic bacteria to infants through the potential use of chlorhexidine rinse and xylitol products for caregivers, and fluoride varnish for both the caregiver

**A MINIMUM OF EVERY
six months is recommended
for children at moderate
caries risk, even if the child
lives in a community that
already receives the benefits
of water fluoridation.**

and the child.³⁶ Additionally, the necessary changes in the child's diet, tooth-brushing, and fluoride application can be identified from the risk analysis. Expected parental compliance to recommended treatment protocols is essential for moderate and high caries risk children.

Parents should be given additional information and anticipatory guidance on the prevention of dental disease that is specific to the their child's needs and caries risk factors, e.g., information on oral hygiene, growth and development, teething, digit or pacifier habits, oral habits, diet and nutrition, and injury prevention (FIGURE 4). The anticipatory guidance

approach is designed to take advantage of time-critical opportunities to implement preventive health practices and reduce the child's risk of preventable oral disease.³⁷

An important component of the visit is to counsel parents to change specific risk factors, which may contribute to caries activity or the child's caries risk. Traditionally, general recommendations to parents such as "brush your teeth twice a day and don't eat candy," have had very limited success. Research shows that family-centered approaches and individualized recommendations are more promising in engaging parents to change specific practices.

Motivational interviewing is a counseling technique that relies on two-way communication between the clinician and the patient or parent and establishes a therapeutic alliance (rapport and trust).³⁸ In this process the clinician asks questions to help parents identify problems; listens to their concerns; encourages self-motivational statements; prepares them for change (discussing the hurdles that interfere with action); sets attainable specific self-management goals; responds to resistance; schedules follow-up appointments; and prepares the parent for their family's specific and unique difficulties, which inevitably arise when instituting a consistent, life-time dental care program for their child.³⁹

Following the brief motivational interviewing (counseling), the parent/caregiver is asked to select two self-management goals or recommendations as their assignments before the next re-evaluation dental visit and to commit to the two goals selected, and is informed that the oral health care providers will follow-up on those goals with them at the next appointment (FIGURE 4).

Recall Visits and Recall Periodicity

The clinician must consider each child's individual needs to determine the appropriate interval and frequency for oral ex-

Self-Management Goals for Parent/Caregiver

Patient name _____ DOB _____



Regular dental visits
for child



Family receives
dental treatment



Healthy snacks



Brush with fluoride
toothpaste at least 2
times daily



No soda



Less or no juice



Wean off bottle
(no bottles for sleeping)



Only water or milk in
sippy cups



Drink tap water



Less or no junk food
and candy



Chew xylitol gum

IMPORTANT: The last
thing that touches
your child's teeth
before bedtime is
the toothbrush with
fluoride toothpaste.

Self-management goals 1) _____

2) _____

Practitioner signature _____ Date _____

FIGURE 4. Self-management goals.

amination; some infants and toddlers with high caries risk should be re-evaluated on a monthly basis.³⁷ Most children at high risk need to be seen on a three-month interval for re-evaluation, additional counseling and clinical preventive services (e.g., fluoride varnish). Children in the moderate-risk category usually are placed on a six-month interval, while low-risk children can be re-evaluated at six- to 12-month intervals.

Parents who have demonstrated compliance with recommendations for three to six months should be scheduled back for a follow-up visit with their child for reassessment of risk. Parents need encouragement early on when new behavioral change is required and should be questioned regarding any difficulties with following recommendations. Reassessment of risk factors and monitoring the progress of improvements in established self-management goals are essential elements of infant oral care visits. Modifications of recommendations or positive reinforcement for successful changes are necessary to achieve and sustain successful risk modification. Parents should be reminded that changing risk factors and lifestyles do not happen overnight and require persistence.

Summary

Pediatric dentists and general dentists have a critical role in preventing and reducing the severity of early childhood caries. Embracing the concepts of caries risk assessment, early establishment of a dental home, medical home with their recommendations integrated within the family home practices are essential. Perinatal and infant oral health and implementation of the techniques, protocols, and care paths highlighted in this paper in a clinical practice can help break the cycle of dental disease in high-risk families and reduce burden of disease. Caries risk assessment, individualized counsel-

ing, clinical preventive services such as fluoride varnish applications, xylitol use, and referral of high-risk infants and children to dental homes are increasingly being recognized as important elements of efforts to engage other pediatric health care providers in reducing the prevalence and severity of early childhood caries.

Many providers adapt caries risk assessment tools to meet their individual practice needs. For example, the Western CAMBRA group uses and recommends the forms presented in **TABLE 2**. AAPD has endorsed and adapted as their 2010 Risk Assessment the guideline presented in **TABLE 3**. Also, some pediatricians have been using an AAP-recommended sticker version of caries risk assessment tools on their charts (**TABLE 1**). Whatever form is chosen, what remains critical is the process of assessing caries risk on a routine basis in an individualized and age-specific manner that can empower practitioners and parents/caregivers in identifying each child's risk and protective behaviors for a targeted "age- and risk-specific" approach to lower their risk for ECC. ■■■■

REFERENCES

1. Dye BA, Tan S, et al, Trends in oral health status: United States, 1988-1994 and 1999-2004. *Vital Health Stat* 11(248):1-92, 2007.
2. Dye BA, Arevalo O, Vargas CM, Trends in paediatric dental caries by poverty status in the United States, 1988-1997 and 1994-2004. *Int J Paediatric Dent* 20(2):132-43, 2010.
3. Vargas CM, Crall JJ, Schneider DA, Sociodemographic distribution of pediatric dental caries: NHANES III, 1988-1994. *J Am Dent Assoc* 129:1229-38, 1998.
4. Poland C III, Hale KJ, Providing oral health to the little ones. *J Indiana Dent Assoc* 82:8-14, 2003.
5. Health and Health Care in Schools, Health disparities experienced by racial/ethnic minority populations. *MMRW* 733, 2004.
6. Dental Health Foundation, The 2006 oral health needs assessment of children. dentalhealthfoundation.org/images/lib/PDF/dhf_2006_report.pdf. Accessed Aug. 23, 2010.
7. Powell LV, Caries prediction: a review of the literature. *Community Dent Oral Epidemiol* 26:361-71, 1998.
8. Wandera A, Bhakta S, Barker T, Caries prediction and indicators using a pediatric risk assessment teaching tool. *ASDC J Dent Child* 67:408-12, 2000.
9. Centers for Disease Control & Prevention, CDC Oral Health

- Resources, National Oral Health Surveillance System. Untreated tooth decay, percentage of third-grade students with untreated tooth decay, overview by state. apps.nccd.cdc.gov/nohss/IndicatorV.asp?Indicator=3. Accessed Aug. 24, 2010.
10. Udesky L, State lags in dental care for children. *New York Times*, May 22, 2010. bayarea.blogs.nytimes.com/2010/05/22/state-lags-in-dental-care-for-children-and-other-highlights-from-sundays-bay-area-pages/. Accessed Aug. 23, 2010.
 11. Child and Adolescent Health Measurement Initiative. 2007 National Survey of Children's Health, Data Resource Center for Child and Adolescent Health website. [nschdata.org](http://nschdata.org/www/nschdata.org). Accessed Aug. 23, 2010.
 12. Ramos-Gomez FJ, Huang GF, et al, Prevalence and treatment cost of infant caries in northern California. *ASDC J* 63(2):108-12, 1996.
 13. Savage MF, Lee JY, et al, Early preventive dental visits: effects on subsequent utilization and costs. *Pediatrics* 114:418-23, 2004.
 14. Ramos-Gomez FJ, Crall JJ, et al, Caries risk assessment appropriate for the age 1 visit (infants and toddlers). *J Calif Dent Assoc* 35(10):687-702, 2007.
 15. American Dental Association. ADA statement on early childhood caries, 2004. ada.org/2057.aspx. Accessed Aug. 23, 2010.
 16. American Academy of Pediatric Dentistry, Infant oral health. *Pediatr Dent* 22:82, 2000.
 17. American Academy of Pediatrics, Recommendations for preventive pediatric health care. *Pediatrics* 105:645, 2000.
 18. American Association of Public Health Dentistry, 2004. First oral health assessment policy. aaphd.org/default.asp?page=FirstHealthPolicy.htm. Accessed Aug. 23, 2010.
 19. Academy of General Dentistry, Policies, guidelines, positions statements and fact sheets, AGD policies on pediatric dentistry. agd.org/issuesadvocacy/policies/dentalcare/. Accessed Aug. 23, 2010.
 20. American Academy of Pediatric Dentistry, Definition of a dental home. aapd.org/media/Policies_Guidelines/D_DentalHome.pdf. Accessed Aug. 23, 2010.
 21. American Academy of Pediatric Dentistry, Policy on the dental home. *AAPD Reference Manual* 31(6):22-3.
 20. Seki M, Yamashita Y, et al, Effect of mixed mutans streptococci colonization on caries development. *Oral Microbiol Immunol* 21(1):47-52, 2006.
 21. Douglass JM, Li Y, Tinanoff N, Association of mutans streptococci between caregivers and their children. *Pediatric Dent* 30:375-87, 2008.
 22. Ramos-Gomez FJ, Bacterial salivary markers' role in ECC risk assessment in infants. *J Dent Res Issue* 85B: 0516, 2006. www.dentalresearch.org. Accessed Aug. 23, 2010.
 23. CDA Foundation, 2010. Oral health during pregnancy and early childhood: evidence based-guidelines for health professionals. Sacramento, Calif.
 24. Gajendra S, Kumar JV, Oral health and pregnancy: a review. *NY State Dent J* 70(1):40-4, 2004.
 25. Ismail AI, Nainar SM, Sohn W, Children's first dental visit: attitudes and practices of U.S. pediatricians and family physicians. *Pediatr Dent* 25:425-30, 2003.
 26. American Academy of Pediatrics, Bright Futures. bright-futures.aap.org/practice_guides_and_other_resources.html. Accessed Aug. 23, 2010.
 27. American Academy of Pediatric Dentistry, Policy on early

- childhood caries (ECC): classifications, consequences, and preventive strategies, 2003. aapd.org. Accessed Aug. 23, 2010.
28. Peretz B, Ram D, et al, Preschool caries as an indicator of future caries: a longitudinal study. *Pediatr Dent* 25(2):114-8, 2003.
29. Tagliaferro EP, Pereira AC, et al, Assessment of dental caries predictors in a seven-year longitudinal study. *J Public Health Dent* 66(3):169-73, 2006.
30. Featherstone JDB, The caries balance: contributing factors and early detection. *J Calif Dent Assoc* 31(2):129-33, 2003.
31. Featherstone JDB, Adair SM, et al, Caries management by risk assessment: consensus statement, April 2002. *J Calif Dent Assoc* 31(3):257-69, 2003.
32. Featherstone JDB, The caries balance: the basis for caries management by risk assessment. *Oral Health Prev Dent 2 Suppl 1*:259-64, 2004.
33. Featherstone JDB, Caries prevention and reversal based on the caries balance. *Pediatr Dent* 28:128, 32; discussion 192-8, 2006.
34. Altarum Institute, 2007. Topical fluoride for high-risk children, development of decision support matrix, recommendations from MCHB expert panel, Washington, D.C.
35. American Dental Association, The ADA Council on Scientific Affairs. (May 2006) Professionally applied topical fluoride executive summary of evidence-based clinical recommendation. ada.org/sections/professionalResources/pdfs/report_fluoride_exec.pdf. Accessed Aug. 23, 2010.
36. Ramos-Gomez FJ, Clinical considerations for an infant oral health care program. *Compendium* 26(5)suppl 1:17-23, 2005.
37. American Academy of Pediatric Dentistry, Clinical guideline on periodicity of examination, preventive dental services, anticipatory guidance and oral treatment for children 2003. aapd.org. Accessed Aug. 23, 2010.
38. Weinstein P, Harrison R, Benton T, Motivating parents to prevent caries in their young children. *J Am Dent Assoc* 135:731-8, 2004.
39. Weinstein P, Provider versus patient-centered approaches to health promotion with parents of young children: what works/does not work and why. *Pediatr Dent* 28:172-6, 2006.
40. The Pew Center on the States, 2010. The cost of delay state dental policies fail one in five children. pewcenter-onthestates.org/uploadedFiles/Cost_of_Delay_web.pdf. Accessed Sept. 17, 2010.

TO REQUEST A PRINTED COPY OF THIS ARTICLE, PLEASE CONTACT Francisco J. Ramos-Gomez, DDS, MPH, MS, University of California, Los Angeles, School of Dentistry, 23-020B CHS, 10833 Le Conte Ave., Los Angeles, Calif., 90095-1668.



Advancing the standard of care for comprehensive implant dentistry since 1951

2010 Las Vegas AAID MAXICOURSE[®] for Implant Dentistry

Participants will learn:

- Biomedical science related to implant dentistry
- Anatomy of the head and neck through cadaver dissection
- Patient evaluation, diagnostic protocol and CT diagnosis
- Implant periodontic, prosthodontic and surgical procedures
- Various implant systems and their application
- Implant Maintenance
- How to market dental implants

Tuition is \$14,500 and 24 month interest-free financing is available. The number of attendees is limited. The eight weekend module program starts in the fall of 2010 and continues to the spring of 2011.

AAID Faculty

Director:

John C. Minichetti, DMD

Co-directors:

Shankar S. Iyer, DDS, MDS

Francis Jones, DDS

Guest speakers include:

Louis Kirkos, DDS, MS, PhD

James L. Rutkowski, DMD, PhD

Maurice Valen, PhD

Nicholas Caplanis, DMD, MS

Frank R. LaMar, DDS

Brian J. Jackson, DDS

Matthew R. Young, DDS

O. Hilt Tatum, DDS

Jaime Lozada, DDS



Approved PACE Program Provider
FAGD/MAGD Credit
Approval does not imply acceptance by a state or provincial board of dentistry or AGD endorsement
10/1/2010 to 9/30/2013
Provider ID# 310502

School of Dental Medicine, UNLV
Las Vegas, NV

**For more information call 1-866-433-1335,
e-mail info@englewooddental.com
or visit: www.aaid-vegasmxcourse.org**